

## PORTABLE AIR HORN APPARATUS

### BACKGROUND OF THE INVENTION

#### I. FIELD OF THE INVENTION

5           This invention relates to air horns used to provide warning sounds over wide distances. More particular, the invention relates to air horn apparatus that is portable.

#### II. BACKGROUND ART

10           Air horns are commonly used as warning devices because they are capable of providing very loud and distinctive sounds that carry over large distances. For example, air horns are used in the mining and construction industry to provide warnings when blasting is about to take place.

          A very common kind of portable air horn apparatus consists of an air horn  
15   attached to a valve device that can be fitted to the neck of a compressed gas canister. The valve device includes a trigger that, when operated, allows compressed gas from the canister to operate the air horn. Devices of this kind are relatively inexpensive and lightweight and can generate sound at a high volume. However, gas canisters contain a finite amount of compressed gas that  
20   allows only a few uses before the canister has to be changed. Even worse, the valve devices tend to allow leakage of the gas from the canisters, thus further reducing the number of uses of the device before replacement of the canister is necessary. Gas leakage can also lead costly or dangerous situations in which an apparatus is unexpectedly found to be inoperative due to leakage and necessary  
25   warnings cannot be given, at least until a new canister can be obtained. The unreliability of apparatus of this kind makes it unsuitable for professional use.

          There is consequently a need for more reliable and effective apparatus of this kind.

## SUMMARY OF THE INVENTION

An object of the invention is to provide a portable air horn apparatus that is dependable even if only used intermittently.

According to one aspect of the invention, there is provided a portable air  
5 horn apparatus, comprising: an air horn adapted to generate sound when  
supplied with air under pressure; an air compressor adapted to generate air  
under pressure; an air conduit interconnecting the compressor and the air horn  
enabling the air under pressure generated by the compressor to be supplied to  
the air horn; an electric motor adapted to operate the air compressor when  
10 energized; a portable source of electrical energy; electrical circuitry electrically  
connecting the portable source of electrical energy to the electric motor to enable  
the electric motor to be energized, the circuitry including a manually operable on-  
off switch having a first position opening the circuitry and a second position  
closing the circuitry; and a housing for physically supporting and interconnecting  
15 at least the air horn, compressor, electric motor, on-off switch and portable  
source of electrical energy, and including a handle adapted to be manually  
graspable by a user of the device.

The invention also relates to such an apparatus without said portable  
source of energy, but adapted to interconnect with such a source (e.g. a battery)  
20 provided by the user.

The apparatus of the present invention requires no reservoir for  
compressed air and is operated by air generated "on demand" under a fixed and  
constant pressure. Thus, unlike reservoir devices, there is no change of  
pressure with time as the reservoir of gas is used up. The sound and sound  
25 volume thus do not change with time.

By using a suitable portable power source, the device can be kept  
operational for a prolonged period of time and can be restored to operational  
status merely by recharging or replacing the portable power source. The  
apparatus can be made relatively light in weight and convenient to use.

## BRIEF INTRODUCTION OF THE DRAWINGS

Fig. 1 is a cross section of one preferred form of an apparatus according to the present invention;

Fig. 2 is an underside view of a tubular element used in the embodiment of Fig. 1 showing an elongated slot;

Fig. 3 is a cross-section taken on the line III-III of Fig. 1; and

Fig. 4 is a circuit diagram of the circuitry employed in the embodiment of Fig. 1.

## DETAILED DESCRIPTION OF THE INVENTION

The device shown in Fig. 1 of the accompanying drawings is one embodiment of a portable air horn apparatus 10 according to the present invention. The apparatus 10 has a housing 12 consisting of two main parts. A first part is in the form of an elongated tubular element 14, and a second part is in the form of an elongated member 16 attached to the tubular element 14 at one end of the elongated member and extending from the tubular element 14 at an angle, preferably in the range of about 75 to 105 degrees, and optionally around 90 degrees. The apparatus consequently resembles a pistol with the tubular element 14 forming the "barrel" and the elongated member 16 forming a handle 18 in the form of a "pistol grip" that can be grasped by a user in one hand to carry and operate the apparatus. The housing 12 serves the purpose of physically supporting and interconnecting the parts of the apparatus so that they form a unitary whole. The housing 12 also encloses and protects most of the parts and provides an attractive and functional appearance to the apparatus.

The tubular element 14, which is preferably made of metal but may be made of plastics or any other suitable material, encloses an air horn 20 (which may be of a conventional design), an air compressor 22 that generates a stream of air under pressure and an electric motor 24 for operating the air compressor 22. The tubular element 14 is open at opposite ends 26 and 28, and has a slot-like opening 30 positioned centrally between the opposite ends in the lower part of outer wall 32 of the tubular element. The slot-like opening 30, which

is shown more clearly in Fig. 2, allows the components of the apparatus to be interconnected without any connecting parts being visible from the exterior of the apparatus. The shape of the slot conforms to the shape of the handle 18 at the point where the handle joints the tubular element 14 so that no parts of the slot are visible from the outside.

The motor 24, air compressor 22 and air horn 20 may be held in place within the tubular element 14 simply by a friction fit if parts of these components are dimensioned to fit snugly within the tubular element (as shown). However, these components may be fixed more permanently by means of screws (not shown) or the like extending through the outer wall 32 of the tubular element into holes drilled into the components.

A flexible hose 34 forms an air conduit for supplying a stream of compressed air from the compressor 22 to the air horn 20. One end of the hose is fitted over a nipple 36 projecting from the compressor and the other is fitted over a nipple 38 that communicates with to the interior of the air horn 20, which contains a vibratable diaphragm 40 that generates a sound that is then amplified by an elongated trumpet element 42. A central region of the hose 34 is secured within a clip 44 attached to the air horn 20 to reduce the likelihood that the hose will become detached at one or both ends during use or transportation.

The electric motor 24 is a DC motor having, for example, a conventional armature 46 and magnets 48 illustrated in broken lines. A central shaft 50 extends from the motor into the air compressor 22 to rotate a compressor rotor 52 to pressurize air drawn into the compressor from the exterior. The interior of the compressor 22 is shown in more detail in the cross-sectional view of Fig. 3 and it will be seen that the rotor 52 is provided with four vanes 54 that are slidably held within slots 55 in the rotor. The vanes may move between a retracted position, in which most of the vane is held in the slot, to an extended position, in which most of the vane projects from its associated slot. The rotor 52 is mounted off-center within a chamber 56 within the compressor and the vanes divide the free space within the chamber into four segments 58, 59, 60 and 61. As the rotor rotates, air trapped in segment 58 (which enters the chamber via

port 62), is moved around the chamber into a smaller volume formerly occupied by segment 59, the smaller volume being due to the off-centre location of the rotor in the chamber. Consequently, the air is compressed and leaves the chamber 56 through a gas delivery port 64 formed within nipple 36 (see Fig. 1).

- 5 As the rotor continues to rotate, the free volume increases in segments 60 and 61, so the gas in these segments is reduced in pressure and draws more air into the chamber when connected to the port 62.

- Referring again to Fig. 1, the second part of the housing in the form of an elongated member 16 is preferably made of a molded plastics material (e.g. injection molded plastics) that is shaped to fit the contours of the hand and is attached to the tubular element 14 by means of screws (not shown) or by an adhesive. The elongated member may itself consist of two parts separated from each other along a vertical plane running centrally of the apparatus from front to rear. The two parts may be joined together by screws or adhesive (not shown).
- 10 This elongated member 18 contains a manually operable on-off switch 25 held firmly within the handle 18, circuitry 82 and at least part of a portable energy source 66. The manually operable on-off switch 25 is preferably operated by a trigger 27 that can be squeezed by a user's index finger when gripping the handle. The trigger 27 is biased outwardly to the "off" position, and remains in that position until squeezed to the "on" position. Releasing the trigger causes it to return under the spring bias to the "off" position. Thus, again, the apparatus resembles a pistol in its appearance and operation.

- The electric motor 24 is energized by the portable energy source 66 via the circuit 82 when the manually operable trigger 27 is in the "on" position. In turn, the motor drives the compressor and the resulting compressed air is directed to the air horn which creates a piercing sound. Consequently, in use, the user simply squeezes the trigger 25 for as long as the sound is to be made. Releasing the trigger then ends the generation of the sound.

- The portable energy source 66 for the apparatus is provided at the lower end of the handle 18. The portable energy source is preferably a rechargeable battery of the kind used to power portable tools, such as electric drills or electric

screw drivers. However, other portable energy sources may be employed, e.g. non-rechargeable batteries or fuel cells. It is of course important to use an energy source that is not too bulky or heavy, otherwise the apparatus will not be portable (e.g. transportable by hand by a single user without the need for a vehicle or movable support). Normally, the bulkier and heavier the power source, the longer the apparatus remains powered and ready for use. However, it is generally desirable to make the weight of the power source 2.5 Kg or less (more preferably 1 Kg or less) in order to make the apparatus readily portable.

In the illustrated embodiment, the portable energy source has an enlarged body 68 provided with an upstanding elongated projection 70. The projection 70 extends fully into a hollow space within the handle 18 from below and the enlarged body 68 remains mostly outside the handle except for the top edge that is covered by an enlarged cowling 72 forming a lower end 74 of the handle 18. The cowling 72 removably attaches to the body 68 via releasable catches (not shown) formed on opposite sides of the cowling 72 and engaging opposite sides of the energy source 66. The portable energy source can therefore be removed from the housing 12 when desired and replaced or returned as needed. The enlarged body 68 has a flat lower surface 76 so that the portable energy source may act as a stand for the apparatus when placed on a flat support. Additionally, when the portable energy source is a rechargeable battery, the lower surface may also be provided with contacts (not shown) for electrical connection to a charging device or docking station of a known kind. Alternatively, the portable energy source or the housing 12 may have a socket for connection to a source of current for recharging the portable power source from a suitable charger.

The upper end 78 of the upstanding projection 70 engages with an electrical connector 80 forming part of circuitry 82 for the apparatus. Electrical contacts 84 on the upper end of the upstanding projection engage with contacts 86 in the connector so that the circuit 82 may be energized by the portable power source.

The electrical circuit 82 is shown in more detail in Fig. 4 of the accompanying drawings in which physical components are shown in dotted lines and circuit elements are shown in unbroken lines. The upper end 78 of the upstanding projection 70 of the portable energy source 66 is retained within  
5 electrical connector 80 having metal contacts 86 that connect to the contacts 84 of the portable energy source. A wire 92 is connected to one of the contacts 86 directly to the motor 24. A second wire 94 leads to the manually operable on-off trigger switch 25. A third wire 96 then extends from switch 25 to the motor 24. As will be appreciated, when switch 25 is closed, the motor will be energized and  
10 the air horn will sound.